

In the Claims:

Please amend the claims as follows:

- 1 1. (withdrawn) A photodiode array, comprising:
2 a plurality of arrayed individual diode devices, including:
3 at least one active photodiode; and
4 at least one reference diode.

- 1 2. (withdrawn) The photodiode array of claim 1 wherein the diode devices are
2 fabricated on a single semiconductor substrate.

- 1 3. (withdrawn) The photodiode array of claim 2 wherein the photodiode array
2 includes a substrate and each of the diode devices includes:
3 a first layer of substantially intrinsic semiconductor material of a first
4 conductivity type;
5 a second layer of a doped semiconductor material of the first conductivity type
6 located at one of in and over the first layer;
7 a third layer of semiconductor material of a second conductivity type located
8 at one of in and over the second layer.

1 4. (withdrawn) The photodiode array of claim 3 wherein each diode device
2 further includes:

3 a region of a doped semiconductor material of the second conductivity type
4 that is one of:

5 sandwiched as a layer between the substrate and the first layer; and

6 in contact with the first layer; and

7 the region having a higher carrier concentration than the first layer.

1 5. (withdrawn) The photodiode array of claim 2 further comprising a biasing
2 circuit that:

3 applies a first bias voltage to each of the at least one reference diode;

4 applies a second bias voltage to each of the at least one active photodiode, the
5 second bias voltage having a predetermined relationship with the first bias voltage;

6 monitors operation of the at least one reference diode at the applied first bias
7 voltage; and

8 adjusts the applied first bias voltage to drive the monitored operation of the at
9 least one reference diode to an optimal condition.

1 6. (withdrawn) The photodiode array of claim 5 wherein the predetermined
2 relationship between the first and second bias voltages is equality.

1 7. (withdrawn) The photodiode array of claim 5 wherein the biasing circuit
2 comprises:
3 a bias voltage generator having outputs connected to apply the first bias
4 voltage to the at least one reference diode and the second bias voltage to the at least one
5 active photodiode;
6 a detector having an input connected to the at least one reference diode to
7 measure an operational characteristic thereof in response to the first bias voltage; and
8 a comparator that compares the measured certain operational characteristic to
9 a reference value and controls the bias voltage generator to adjust the first and second bias
10 voltages in a manner that drives the measured certain operational characteristic to
11 substantially match the reference value.

1 8. (withdrawn) The photodiode array as in claim 7 wherein the operational
2 characteristic comprises a reference diode responsivity at the applied first bias voltage.

1 9. (withdrawn) The photodiode array as in claim 8 wherein the reference diode
2 responsivity is measured for a known intensity of light incident on the at least one reference
3 diode.

1 10. (withdrawn) The photodiode array as in claim 9 wherein the reference diode
2 responsivity is measured in the absence of incident light on the at least one reference diode.

3 11. (withdrawn) The photodiode array as in claim 6 wherein:
4 the at least one reference diode provides an output current; and

5 the detector measures the output current of the at least one reference
6 photodiode at the applied first bias voltage.

1 12. (withdrawn) The photodiode array as in claim 11 wherein the detector
2 measures the output current at one of (a) a known intensity and (b) zero intensity of light
3 incident on the at least one reference diode.

1 13. (withdrawn) The photodiode array as in claim 11 wherein the reference
2 diode includes:

3 a high field region; and

4 means for injecting charge carriers to be swept into the high field region to
5 generate the reference diode output current.

1 14. (withdrawn) The photodiode array as in claim 13 wherein:

2 the biasing circuit comprises a current generator for applying a predetermined
3 input current to the means for injecting charge carriers;

4 the detector operates to determine a relationship between the reference diode
5 output current and the input current and thereby obtain a value indicative of responsivity of
6 the at least one reference diode;

7 the reference value comprises a reference responsivity; and

8 the comparator operates to compare the value indicative of responsivity to the
9 reference responsivity.

1 15. (withdrawn) The photodiode array as in claim 11 wherein the detector
2 determines a derivative of the logarithm of the output current, and wherein the comparator
3 compares the obtained derivative of the logarithm of the output current to a reference.

1 16. (withdrawn) The photodiode array of claim 5 wherein the biasing circuit is
2 additionally fabricated in the single semiconductor substrate.

1 17. (original) A biasing circuit for an avalanche photodiode having at least one
2 associated reference diode, the biasing circuit comprising:

3 a bias voltage generator having a first output for applying a first bias voltage
4 to the at least one reference diode and a second output for applying a second bias voltage to
5 the avalanche photodiode, the second bias voltage having a predetermined relationship with
6 the first bias voltage;

7 a detector having an input connected to the at least one reference diode to
8 measure an operational characteristic thereof in response to the first bias voltage; and

9 a comparator that compares the measured operational characteristic to a
10 reference value and that controls the bias voltage generator to adjust the first bias voltage and
11 the second bias voltage in a manner that drives the measured operational characteristic to
12 substantially match the reference value.

1 18. (original) The biasing circuit as in claim 17 wherein the predetermined
2 relationship between the first bias voltage and the second bias voltage is equality.

1 19. (original) The biasing circuit as in claim 17 wherein the operational characteristic
2 comprises a reference diode responsivity at the applied first bias voltage.

1 20. (original) The biasing circuit as in claim 19 wherein the reference diode
2 responsivity is measured for a known intensity of light incident on the at least one reference
3 diode.

1 21. (original) The biasing circuit as in claim 20 wherein the reference diode
2 responsivity is measured in the absence of incident light on the at least one reference diode.

1 22. (original) The biasing circuit as in claim 17 wherein:
2 the at least one reference diode provides an output current; and
3 the detector measures the output current of the at least one reference
4 photodiode at the applied first bias voltage.

1 23. (original) The biasing circuit as in claim 22 wherein the detector measures the
2 output current at one of (a) a known intensity and (b) zero intensity of light incident on the at
3 least one reference diode.

1 24. (original) The biasing circuit as in claim 22 wherein the reference diode includes:
2 a high field region; and
3 means for injecting charge carriers to be swept into the high field region to
4 generate the reference diode output current.

1 25. (original) The biasing circuit as in claim 24 further including:
2 a current generator for applying a predetermined input current to the means for
3 injecting charge carriers;
4 and wherein:

5 the detector operates to determine a relationship between the reference
6 diode output current and the input current and thereby obtain a value indicative of
7 responsivity of the at least one reference diode;
8 the reference value comprises a reference responsivity; and
9 the comparator operates to compare the value indicative of
10 responsivity to the reference responsivity.

1 26. (original) The biasing circuit as in claim 22 wherein the detector determines a
2 derivative of the logarithm of the output current, and wherein the comparator compares the
3 obtained derivative of the logarithm of the output current to a reference.

1 27. (original) The biasing circuit of claim 17 wherein the biasing circuit, reference
2 diode and avalanche photodiode are fabricated in the same semiconductor substrate.

1 28. (withdrawn) An avalanche photodiode, comprising:
2 a high field area associated with a pn junction; and
3 means for injecting charge carriers to be swept into the high field region to
4 generate diode output current.

1 29. (withdrawn) The avalanche photodiode as in claim 28:
2 wherein the pn junction is formed from a first conductivity type layer and a
3 second conductivity type layer formed at one of in and over the first conductivity type layer;
4 and

5 wherein the means for injecting comprises a heavily doped second
6 conductivity type region physically separate from the layers forming the pn junction and
7 comprising a source of the charge carriers that are swept into the high field area.

1 30. (withdrawn) The avalanche photodiode as in claim 29 further including an
2 electrode connected to the heavily doped second conductivity type region, the electrode
3 receiving an input current in response to which the charge carriers are injected into the high
4 field area.

1 31. (withdrawn) The avalanche photodiode as in claim 29 further including a
2 substantially intrinsic layer of the first conductivity type physically separating the heavily
3 doped second conductivity type region from the first conductivity type layer of the pn
4 junction.

1 32. (withdrawn) The avalanche photodiode as in claim 31 further including an
2 additional first conductivity type region separating the heavily doped second conductivity
3 type region from the substantially intrinsic layer.

1 33. (withdrawn) The avalanche photodiode as in claim 31 further including a
2 substrate layer underlying the heavily doped second conductivity region.

1 34. (original) The avalanche photodiode as in claim 33 further including a pair of
2 electrodes, one electrode of the pair connecting to a layer of the pn junction and another
3 electrode of the pair connecting to the substrate layer, wherein a reverse bias voltage is
4 applied between the pair of electrodes to generate the high field area.

1 35. (original) A method for biasing an avalanche photodiode having an associated
2 reference diode, comprising the steps of:
3 generating a first bias voltage for application to the reference diode;
4 generating a second bias voltage for application to the avalanche photodiode,
5 the second bias voltage having a predetermined relationship with the first bias voltage;
6 measuring an operational characteristic of the reference diode in response to
7 application of the first bias voltage;
8 comparing the measured operational characteristic to a reference value; and
9 adjusting the first bias voltage and second bias voltage in a manner that drives
10 the measured operational characteristic to substantially match the reference value.

1 36. (currently amended) The method as in claim [[34]] 35 wherein the
2 predetermined relationship between the first and second bias voltages is equality.

1 37. (original) The method as in claim 35 wherein the operational characteristic
2 comprises a reference diode responsivity at the applied first bias voltage.

1 38. (original) The method as in claim 35 further including the step of applying a
2 known intensity of light incident on the reference diode, and wherein the step of measuring
3 the reference diode responsivity is measured for that known intensity of light.

1 39. (original) The method as in claim 37 wherein the reference diode responsivity is
2 measured in the absence of incident light on the at least one reference photodiode.

1 40. (original) The method as in claim 35 further including the step of generating an
2 output current from the reference diode and wherein the step of measuring comprises the step
3 measuring the output current at the applied first bias voltage.

1 41. (original) The method as in claim 40 wherein the output current is measured at
2 one of (a) a known intensity and (b) zero intensity of light incident on the reference diode.

1 42. (original) The method as in claim 40 further comprising the steps of:
2 applying a predetermined input current to the matched reference diode;
3 injecting charge carriers proportional to the predetermined input current to be
4 swept into a high field region of the reference diode to generate the diode output current; and
5 determining a relationship between the output current and the input current to
6 obtain a value indicative of the responsivity of the reference diode;
7 wherein the reference value comprises a reference responsivity, and
8 wherein the step of comparing compares the obtained value indicative of the
9 responsivity to the reference responsivity.

1 43. (original) The method as in claim 40 further including the step of:
2 determining a derivative of the logarithm of the output current, and wherein
3 the step of comparing compares the obtained derivative of the logarithm of the output current
4 to a reference.